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ELECTROLYTIC CELL ARRANGEMENT

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Fig. 1

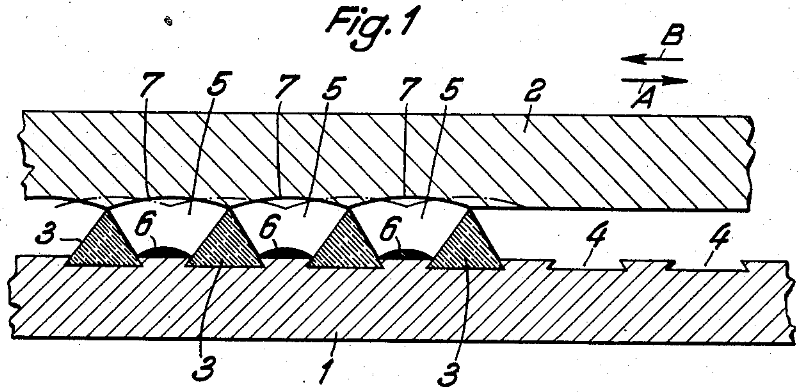
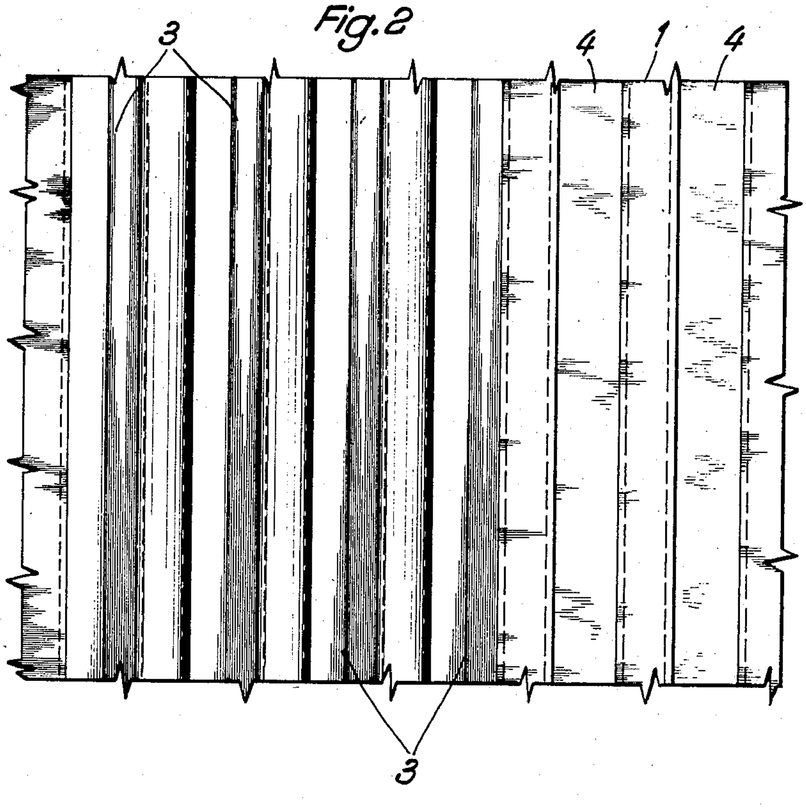


Fig. 2



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ELECTROLYTIC CELL ARRANGEMENT

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2 Claims. (Cl. 204—219)

The present invention relates to an electrolytic cell arrangement. More particularly, the present invention relates to an electrolytic cell having a mercury cathode.

Conventional electrolytic cells using mercury cathodes are formed with a flat bottom portion which have a fairly limited width. The mercury is disposed on the flat bottom portion to form a substantial planar layer of mercury. In electrolytic cells wherein a flowing stream of mercury is used as the cathode, it is very difficult to maintain an even mercury layer in the bottom of the cell. It is clear that where a broad planar layer of mercury is used it is possible to obtain therein small inhomogeneities.

In addition, where the planar layer of mercury is continuously flowing in the electrolytic cell, certain inclinations and unevenness of the mercury layer results. Therefore, in order to insure a sufficient covering for the bottom of the electrolytic cell, it is necessary to provide a substantial amount of mercury. It is quite clear that the larger the width of the electrolytic cell, the greater will be the amount of mercury needed in order to insure an even mercury cathode.

The present invention overcomes the disadvantages of the conventional type electrolytic cells by dividing up the bottom of the electrolytic cell into a plurality of strip-shaped portions which are separated from one another and by disposing the mercury cathode within the strip-shaped portions.

Accordingly, it is an object of the present invention to overcome the above-described disadvantages of conventional electrolytic cells.

A second object of the present invention is to provide a new and improved electrolytic cell arrangement.

Another object of the present invention is to provide a new and improved electrolytic cell arrangement using mercury cathodes.

It is a further object of the present invention to provide a new and improved electrolytic cell arrangement wherein the mercury used for the mercury cathode thereof is utilized in a highly efficient manner.

With the above objects in view the present invention mainly consists of an electrolytic cell arrangement including a base member, a plurality of spaced electrical insulating members arranged on one face of the base member, an anode mounted on the electrical insulating members spaced from the face of the base member, and electrically conductive cathode material disposed on the face of the base member between the spaced electrical insulating members and spaced from the anode to form a cathode for the electrolytic cell.

In a preferred embodiment of the present invention, each of the insulating members has a polygonal cross-section with a planar surface portion attached to the base member. The insulating members also have-knife-edged portions spaced from the base member so that the anode can be mounted on these knife-edged portions of the insulating members to be spaced from the face of the base member.

In another preferred embodiment of the present invention the insulating members divide the face of the base member into a plurality of parallel elongated strip-shaped portions and the material used for the cathode is mercury which flows through the electrolytic cell along the strip-shaped portions, substantially covering the same.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a transverse sectional view of an electrolytic cell constructed in accordance with the present invention; and

Fig. 2 is a plan view of the apparatus shown in Fig. 1 with the top anode portion removed.

Referring to the drawings it can be seen that the electrolytic cell is formed with a base member **1** made of an electrically conductive material. The upper face of the base member **1** is formed with a plurality of parallel elongated undercut grooves **4**. The grooves **4** shown in Figs. 1 and 2 are dovetail grooves.

Slidably mounted in each of the grooves **4** is an electrical insulating member **3** having a triangular cross-section. The insulating members **3** may be made from glass or porcelain or similar types of insulating material. It can be seen that each of the insulating members **3** is arranged in its respective groove **4** so that the insulating member **3** cannot be moved away from the base member **1** due to the dovetail groove arrangement. However, it is clear that the insulating members **3** may be easily moved along the base member **1** to be removed or replaced.

Mounted on the upper-knife-edged portions of the insulating members **3** is the anode **2** of the electrolytic cell. The anode **2** as shown is a planar electrode with the lower face portion thereof resting along the upper edge portions of the insulating members **3**. These insulating members serve to space the anode from the base member **1**.

As can best be seen in Fig. 1, the facing side portions of each pair of adjacent insulating members **3** form together with the surface portion of the base member **1** therebetween a substantially U-shaped channel **5**. These channels **5** are parallel to one another and are elongated. Disposed in each of these channels is an electrically conductive material **6** which serves as the cathode for the electrolytic cell arrangement. This material is preferably mercury.

In electrolytic cells, wherein mercury is used as the cathode and wherein the mercury flows through the electrolytic cell to form an amalgam with material liberated from the electrolytic solution, it can be seen that with the construction as shown in Figs. 1 and 2 the mercury is most efficiently used. That is, the mercury cathode of the electrolytic cell is broken up into a plurality of flowing mercury streams. Each of these mercury streams substantially cover the surface portion of the base member **1** on which it is respectively disposed.

The upper surface of each of the mercury streams **6** is in the form of a meniscus so that the maximum surface area is provided opposite the lower surface of the anode **2**.

The anode **2** is preferably made movable towards and away from the base member **1** as well as in a direction parallel to the base member. In operation, therefore, an electrolyte is introduced between the cathode **6** and the anode **2**. Proper sources of energization and operating potential are applied between the anode 2 and the base member 1 so that proper operating potentials are developed between the anode 2 and the cathode 6 across the electrolyte which is disposed in the channel 5.

As the electrolytic process continues it is possible for a portion of the anode to wear away as is shown by the arcuate surface portion 7 in the lower surface of the anode 2. Since certain strip-shaped portions of the anode 2 rest on the upper knife edges of the insulating members 3, these narrow strip-shaped portions will not come directly into contact with the electrolyte and therefore will not be worn away as much as the remainder of the anode which does come directly into contact with the electrolyte.

Accordingly, with the electrolytic cell arrangement of the present invention, after a period of time when the arcuate-shaped portions 7 have increased approximately to the amount shown, the anode 2 can be shifted in the direction of the arrow A. When this occurs the peaked portions which previously made contact with the knife edges of the insulating members 3 can now be arranged in the region between these knife edges as shown by the dotted lines in Fig. 1. The center portion of the arcuate-shaped surface portions 7 will then rest on the knife edges of the members 3.

The electrolytic process can continue and when the anode wears away again, the anode 2 can be shifted back the same amount in the direction of the arrow B. This shifting arrangement can be carried out until the anode 2 has to be replaced or the electrolytic process is completed. It is apparent that such an arrangement provides a highly efficient electrolytic cell.

The means for moving the anode 2 in the various directions have not been shown in order to avoid unnecessarily complicating the drawing. Similarly, the means for introducing the mercury when streams of flowing mercury are used and the means for removing the amalgam formed with the mercury have not been shown since these features would also unnecessarily complicate the drawing.

With the present invention the cells can have any desired width since the thickness and arrangement of the mercury cathode no longer is limited by the overall width of the cell. Rather for a wider cell, it is merely necessary to have an additional number of insulating members 3 mounted on the base member 1 so that additional strips of cathode material are provided. Also with the triangular cross-section of the insulating members 3, it is clear that a substantial portion of the anode surface is left free for the electrolytic process.

Normally, when the cathode current intensity is increased, the over voltage at the anode increases by a greater amount than would be the case if the anode current intensity were increased by the same amount. However, with the present arrangement, this increase in over voltage does not take place since most of the lower surface of the anode is left uncovered and in contact with the electrolyte.

The anode 2 may be made of carbon or similar material and it is clear that the insulating members 3 may have different shapes other than the triangular cross-section. For example, instead of having planar faces, the insulating members may have concave or convex surface portions.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of electrolytic arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in an electrolytic cell having a mercury cathode, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In an electrolytic cell, in combination, a base member; a plurality of elongated parallel electrical insulating ridges arranged on one face of said base member and covering a substantial portion of said face, each of said insulating ridges having a wide base portion covering a portion of said one face of said base member and a narrow elongate top edge, said insulating ridges being transversely spaced from each other and defining with uncovered portions of said face of said base member a plurality of elongate parallel channels; an anode extending over said top edges of said electrical insulating ridges spaced from said face of said base member and substantially enclosing each of said elongated parallel channels formed between adjacent insulating ridges; and a mercury cathode formed by a plurality of flowing mercury streams, each of said mercury streams flowing through one of said elongated parallel channels and substantially covering said respective portion of said face of said base member forming part of said respective channel.

2. In an electrolytic cell, in combination, a base member; a plurality of elongated electrical insulating ridges arranged on one face of said base member and covering a substantial portion of said face, said insulating ridges having a wide base portion covering a portion of said one face of said base member and a narrow top edge, said insulating ridges defining with uncovered portions of said face of said base members a plurality of channels; an anode extending over said electrical insulating ridges spaced from said face of said base member and substantially enclosing each of said channels formed between adjacent insulating ridges, said anode being movable towards and away from said face of said base member and in a direction parallel to said face of said base member; and a mercury cathode formed by a plurality of flowing mercury streams, each of said mercury streams flowing through one of said channels and substantially covering said respective portion of said face of said base member forming part of said respective channel.

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